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Indian Standard

SPECIFICATION FOR SHELLAC WAX

(First Revision)

UDC 665·772 : 665·944·73

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4

August 1987

Indian Standard

SPECIFICATION FOR SHELLAC WAX

(*First Revision*)

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(*Continued on page* 2)

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Indian Standard

SPECIFICATION FOR SHELLAC WAX

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 20 October 1986, after the draft finalized by the Lac and Lac Products Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard was originally published in 1969. In view of the experience gained during the years in manufacture and use of shellac wax, the Committee decided to revise it. In this revision, iodine value and saponification value have been deleted. Penetration value and solvent retention value have been incorporated besides some modifications have been carried out in the requirements of some of other characteristics. Moreover, Grade 3 has been incorporated in this revision.

0.3 Shellac wax is obtained as a by-product during the refinement of shellac. It consists essentially of ceryl esters of lignoceric, cerotic and aleuritic acids, and 10 to 14 percent of free wax acids. It also contains alcohols, hydrocarbons and lac resins.

0.4 Shellac wax is used in polishes and as a component of electrical insulating materials. It can successfully substitute some imported waxes in polishing compositions. Unfortunately, however, commercial shellac wax varies considerably in quality depending on the source and degree of refinement carried out on the product. This standard aims to prescribe the quality requirements of shellac wax for its general commerical uses and to ensure the supply of quality material to the consumers.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for shellac wax

2. REQUIREMENTS

2.1 Description — The material shall be hard and shall show conchoidal fracture on crushing.

2.2 Grades — The material shall be supplied in three grades, namely, Grade 1, Grade 2 and Grade 3.

2.3 The material shall also comply with the requirements given in Table 1.

TABLE 1 REQUIREMENTS FOR SHELLAC WAX

SL No.	CHARACTERISTIC	REQUIREMENT			METHOD OF TEST (REF TO APPENDIX)
		Grade 1	Grade 2	Grade 3	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Melting point, °C	70-80	70-80	65-70	A
ii)	Colour (To be checked visually)	Light yellow	Light brown	Greenish brown	—
iii)	Acid value, *Max*	10·0	25·0	35·0	B
iv)	Natural resin content (matters soluble in 70 percent ethanol), *Max*	5·0	7·0	9·0	C
v)	Volatile matter, percent by mass, *Max*	1·0	1·5	2·0	D
vi)	Ash, percent by mass, *Max*	0·5	1·0	1·5	E
vii)	Relative density at 27°C/27°C *Max*	0·970	0·980	0·990	F
viii)	Penetration value, *Max*	3·0	10·0	20·0	G
ix)	Solvent retention value, percent by mass, *Max*	18·0	16·0	14·0	H

3. PACKING AND MARKING

3.1 Packing — Unless otherwise agreed to between the purchaser and the manufacturer, slabs of wax not weighing more than 50 kg shall be packed in heavy cee jute bags (*see* IS : 2874-1964*).

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*Specification for heavy cee jute bags.

3.2 Marking — Each bag shall be suitably marked with the following information:

- a) Name of the material and its grade;
- b) Name of the manufacturer and/or its recognized trade-mark, if any;
- c) Batch or code number; and
- d) Tare, net and gross weights.

3.2.1 Each bag may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the Standard Mark may be granted to manufacturers or processors, may be obtained from the Bureau of Indian Standards.

4. SAMPLING

4.1 Representative samples of the material shall be drawn according to the method prescribed in Appendix J.

5. TESTS

5.1 The material shall be tested as prescribed in Appendices to this standard.

5.2 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977*) shall be used in tests.

NOTE — ' Pure chemicals ' shall mean chemicals that do not contain impurities which affect the results of analysis.

APPENDIX A

[*Table* 1, *Sl No.* (i)]

DETERMINATION OF MELTING POINT

A-1. APPARATUS

A-1.1 Thermometer — of a suitable range, with an accuracy of 0·1°C and graduated at every 0·1°C.

---

*Specification for water for general laboratory use (*second revision*).

A-1.2 Test Tube — With a centrally bored cork to take the thermometer. The cork shall have a slit to permit the circulation of air.

A-1.3 Water-Bath — of a suitable type, with a thermometer.

A-2. PROCEDURE

A-2.1 Melt the sample of wax by warming it in a water-bath at a temperature just sufficient to melt it. Dip the thermometer and withdraw, so as to get the bulb thinly coated with the wax. Let it cool for 24 hours. Insert this thermometer into the test tube through the bored cork and then place the test tube in the water-bath. Raise the temperature gradually at the rate of 1°C in three minutes. Note the temperature, accurate to 0·1°C, at which a transparent drop forms on the end of the thermometer bulb. Record this temperature as the melting point of the wax.

APPENDIX B

[*Table* 1, *Sl No.* (ii)]

DETERMINATION OF ACID VALUE

B-1. APPARATUS

B-1.1 Erlenmeyer Flasks — 250-ml capacity, made of alkali-resistant glass.

B-1.2 Reflux Air Condenser — at least 65 cm long.

B-1.3 Water-Bath or Electric Hot-Plate — with rheostat control.

B-2. REAGENTS

B-2.1 Alcoholic Potassium Hydroxide Solution — Dissolve 5·6 g of potassium hydroxide in 95 percent ethanol (*v/v*) or rectified spirit made aldehyde-free as described in **G-3.4** of IS : 323-1959* and make up to one litre. Allow to settle overnight in a dark place, decant the clear liquid and keep in a bottle closed tight with a cork or rubber stopper.

B-2.2 Phenolphthalein Indicator Solution — one percent (*w/v*) solution in 95 percent ethanol (*v/v*) or rectified spirit (*see* IS : 323-1959*).

B-2.3 Standard Hydrochloric Acid — 0·5 N, prepared from concentrated hydrochloric acid (*see* IS : 265-1976†).

---

*Specification for rectified spirit (*revised*).

†Specification for hydrochloric acid (*second revision*).

B-2.4 Solvent — a mixture of equal volumes of pure toluene and ethanol neutral to phenolphthalein.

B-3. ACID VALUE

B-3.1 Procedure — Weigh accurately about 5 g of the sample in a 250-ml Erlenmeyer flask. Add 25 ml of the solvent and heat under reflux until dissolved. Add a few drops of phenolphthalein indicator and titrate with the alcoholic potassium hydroxide solution until faintly pink. Determine the normality of the alcoholic potassium hydroxide solution with standard hydrochloric acid.

B-3.2 Calculation

$$\text{Acid value} = \frac{56{\cdot}1\, V N}{M}$$

where

V = volume in ml of the potassium hydroxide solution required,

N = normality of the potassium hydroxide solution, and

M = mass in g of the material taken for the test.

APPENDIX C

[*Table* 1, *Sl No.* (iv)]

DETERMINATION OF NATURAL RESIN CONTENT

C-1. PROCEDURE

C-1.1 Weigh 10 g of the powdered wax into an Erlenmeyer flask of 250 ml capacity and add 100 ml of 70 percent ethanol (*v/v*) Boil under reflux for two and a half hours, cool and filter through glasswool into a weighed dish. Evaporate the filtrate to dryness and heat in an oven at 105°C to constant weight and express as a percentage of the sample.

APPENDIX D

[*Table* 1, *Sl No* (v)]

DETERMINATION OF VOLATILE MATTER

D-1. PROCEDURE

D-1.1 Weigh accurately about 50 g of the material in a suitable moisture dish previously dried and weighed and place it on a sand bath at approximately 150°C until frothing ceases. Cool the dish in a desiccator and weigh with the lid on. Heat the dish again in an oven at 100 ± 2°C for 30 minutes and weigh. Repeat the process until the difference between two successive weighings is less than one milligram. Record the lowest weight obtained.

D-2. CALCULATION

$$\text{Volatile matter, percent by mass} = \frac{100\,(M_1 - M_2)}{M_1 - M}$$

where

M_1 = mass in g of the dish with the material before heating,
M_2 = mass in g of the dish with the material after heating, and
M = mass in g of the empty dish.

APPENDIX E

[*Table* 1, *Sl No.* (vi)]

DETERMINATION OF ASH

E-1. APPARATUS

E-1.1 Platinum Dish — 100 ml capacity.

E-2. PROCEDURE

E-2.1 Heat the platinum dish to redness, cool to room temperature in a desiccator and weigh. Take about 25 g of the sample on a watch-glass and weigh accurately. Transfer about three quarters of this quantity to the platinum dish and heat on a Bunsen burner so that the material burns gently at the surface. When about half of the material is burnt away, stop heating, cool and add the remainder of the material. Weigh the watch-glass again and find by difference, the exact weight of sample transferred to the platinum dish. Heat again as before till the material is completely charred. Incinerate in a muffle furnace at 550 to 650°C for one hour. Cool to room temperature in a desiccator and weigh. Repeat incineration, cooling and weighing until the difference between two successive weighings is less than one milligram.

E-3. CALCULATION

$$\text{Ash, percent by mass} = \frac{100\, M_2}{M_1}$$

where

M_2 = mass in g of ash, and

M_1 = mass in g of sample taken for the test.

APPENDIX F

[*Table* 1, *Sl No.* (vii)]

DETERMINATION OF RELATIVE DENSITY

F-1. APPARATUS

F-1.1 Thermostatically Controlled Water-Bath — maintained at 27 ± 1°C.

F-1.2 Relative Density Bottle — 25 ml capacity.

F-2. PROCEDURE

F-2.1 Melt approximately 2 g of the sample in a porcelain crucible at a temperature of about 100°C. Allow to cool to room temperature. Remove the solidified sample from the crucible, warm slightly, if necessary. Store the sample for two hours at a temperature of approximately 27°C. Determine the mass of the sample first in air and then in ethanol at 27°C. Determine the relative density at 27°C/27°C of ethanol by means of the relative density bottle.

F-3. CALCULATION

$$\text{Relative density of the material} = \frac{M_1\, d}{M_1 - M_2}$$

where

M_1 = mass of the sample in air,

d = relative density of ethanol, and

M_2 = mass of the sample in ethanol.

APPENDIX G

[*Table* 1, *Sl No.* (viii)]

DETERMINATION OF PENETRATION VALUE OF SHELLAC WAX

G-1. Outline of the Method — The method consists in measuring the depth to which a specified needle with a definite top load (100 gm/5 s) at room temperature (27 ± 2°C) penetrates the wax sample. The value is expressed in one tenth of a millimetre.

G-2. Apparatus — The apparatus used are:

a) Penetrometer supplied by the *Hutchinson Instrument Co Ltd, and

b) Beaker (10 ml) 3 No. (Internal Dia — 28 mm).

G-3. Procedure — Fill the three beakers with powdered wax sample and melt the wax by placing the beaker in an oven maintained at 100 ± 5°C. Cool to room temperature. The solidified wax is taken out in a cylindrical form, from the beaker, sometimes warming of the wall of the beaker may be necessary. Determine the penetration value by the penetrometer using needle No. NP 45 at three places on the top of wax cylinder. Take the mean of the two nearest values. Similarly determine the penetration value of the other two samples.

G-4. Calculations — The penetration value is the mean of the values for three samples thus obtained.

APPENDIX H

[*Table* 1, *Sl No.* (x)]

DETERMINATION OF SOLVENT RETENTION VALUE OF SHELLAC WAX

H-1. OUTLINE OF THE METHOD

H-1.1 The method consists in dissolving a sample of shellac wax in a mixture of white spirit and turpentine (1 : 1) oil and determining the percent retentivity of the solvent mixture by the wax sample after five days.

---

*Indian Lac Research Institute, Ranchi may help in getting the apparatus.

H-2. APPARATUS

H-2.1 Water-Bath — Electrically heated round or rectangular.

H-2.2 Pipettes — 5 ml graduated.

H-2.3 Petridish (Heat Resistance Glass) — 4 pairs, 22 mm (h) × 47 mm(I. D.).

H-3. REAGENTS

H-3.1 White Spirit – Water white (B. P. 100-160°C).

H-3.2 Turpentine Oil — (*see* grade 1 of IS : 533-1973*).

H-4. PREPARATION OF SOLVENT MIXTURE

Prepare 100 ml solvent mixture by mixing white spirit and Turpentine oil (50 : 50).

H-5. PROCEDURE

H-5.1 Weigh exactly 2 g of the powdered sample in each of the three petridishes (which have been weighed previously) and melt on boiling water-bath. Now add accurately 4 ml of the solvent mixture through a graduated pipette. The wax which gets solidified by the addition of solvent is just redissolved by warming (it takes approximately 2 minutes). Remove the petridishes from the water-bath and cool to room temperature. Simultaneously run a blank experiment also. Weigh the petridishes and determine the mass of 4 ml solvent in blank. Keep the petridishes at room temperatures protected from wind and dust for 5 days (120 h). Weigh the petridishes after 120 h.

H-6. CALCULATIONS

$$\text{Solvent retention value, percent by mass} = \frac{a - b}{a} \times 100$$

where

a = the loss in mass of the solvent without wax after 5 days, and

b = the loss in mass of the solvent with wax after 5 days.

NOTE — The experiment should be conducted at a temperature 27 ± 2°C and relative humidity *Max*, 55 percent.

---

*Specification for gum spirit of turpentine (oil of turpentine) (*first revision*).

APPENDIX J

(*Clause* 4.1)

SAMPLING FOR SHELLAC WAX

J-1. GENERAL REQUIREMENTS FOR SAMPLING

J-1.0 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

J-1.1 Samples shall be taken in a protected place not exposed to damp air, dust or soot.

J-1.2 The sampling instrument shall be clean and dry when used.

J-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

J-1.4 The samples shall be placed in clean, dry and air-tight glass containers. The sample containers shall be of such a size that they are almost completely filled by the sample.

J-1.5 Each container shall be sealed air-tight after filling and marked with full details of sampling, the date of sampling, batch or code number, name of the manufacturer and other important particulars of the consignment.

J-1.6 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

J-1.7 Sampling shall be done by a person agreed to between the purchaser and the manufacturer and in the presence of the purchaser (or his representative) and the manufacturer (or his representative).

J-2. SCALE OF SAMPLING

J-2.1 Lot — All the bags in a single consignment of the material drawn from a single batch of manufacture shall constitute a lot. If the consignment is declared to consist of different batches of manufacture, the batches shall be marked separately and the groups of bags in each batch shall constitute separate lots.

J-2.2 The number of bags (n) to be selected from each lot for the purpose of testing shall depend upon the size of the lot (N) and shall be in accordance with Table 2.

J-2.3 The bags shall be selected at random. In order to ensure the randomness of selection, procedures in IS : 4905-1968* may be followed.

---

*Method for random sampling.

TABLE 2 MINIMUM NUMBER OF BAGS TO BE SELECTED

(*Clause* J-2.2)

LOT SIZE *N*	SAMPLE SIZE *n*
1 to 8	2
9 ,, 27	3
28 ,, 64	4
65 ,, 125	5
126 ,, 216	6
217 ,, 343	7
344 ,, 512	8
513 ,, 729	9
730 ,, 1 000	10
Above 1 000	11

J-3. TEST SAMPLE AND REFEREE SAMPLE

J-3.1 At least 10 percent of slabs in each selected bag shall be taken out for the preparation of test samples and referee samples.

J-3.2 From each of the selected slab cut from different ends at least 100 g of wax. The material collected from all the sampled slabs shall be mixed and then reduced, if necessary, by quartering to yield a composite sample weighing about 0·5 kg. This composite sample shall be divided into three parts, one for the purchaser, another for the manufacturer and the third for the referee. The referee sample shall be used in case of dispute.

J-4. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

J-4.1 Tests for all the characteristics specified in Table 1 shall be conducted on the composite sample.

J-4.2 The lot shall be declared as conforming to this specification if all the test results on the composite sample comply with the corresponding requirements.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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